DOCUMENT RESUME

ED 464 922 TM 033 852

AUTHOR Conley, David T.; Bodone, Francoise
TITLE University Expectations for Student Success: Implications for System Alignment and State Standard and Assessment Policies.
SPONS AGENCY Pew Charitable Trusts, Philadelphia, PA.; Association of American Universities, Washington, DC.
PUB DATE 2002-04-02
NOTE 54p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 1-5, 2002).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Academic Achievement; *College Freshmen; *Expectation; Higher Education; *Outcomes of Education

ABSTRACT

This paper presents findings on key knowledge and skills for university success generated by Standards for Success, a collaborative research project. A series of 8 meetings at major universities involving approximately 400 total participants engaged faculty and staff in activities designed to determine what freshmen must do in entry-level college courses to be successful. The focus was university success, not high school preparation. Results are presented in two frameworks: as outcome statements that summarize the results of the process, and as analysis of the process with implications for organizational functioning and systems alignment. These two focal points provide insight into the ways in which university faculty conceptualize the key prerequisite skills students need in their classes, the gap between high school preparation and university expectation, and the challenge of aligning educational systems between high school and college. One appendix contains the developed key knowledge and skills for English, and the other contains the narrative summary of key points for English and identified key knowledge and skills for mathematics. (SLD)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 464 922

# University Expectations For Student Success: Implications For System Alignment And State Standard And Assessment Policies[1]

David T. Conley
Françoise Bodone

Center for Educational Policy Research
University of Oregon

conley@oregon.uoregon.edu
francoise_bodone@s4s.org

U.S. DEPARTMENT OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Presented at AERA, New Orleans, April 2, 2002

This paper presents findings on key knowledge and skills for university success generated by Standards for Success (S4S), a collaborative research project sponsored by the Association of American Universities (AAU) member universities and by The Pew Charitable Trusts. A series of eight meetings at major universities engaged faculty and staff in activities designed to determine what freshmen must do in entry-level college courses to be successful. The focus was university success, not high school preparation. Results have been analyzed and are presented here in two frameworks; as outcome statements that summarize the results of the process, and as an analysis of the process with implications for organizational functioning and systems alignment. These two focal points provide insight into the ways in which university faculty conceptualize the key prerequisite skills students need in their classes, the gap between high school preparation and university expectation, and the challenge of aligning educational systems between high school and college.

TM033852

[1] Funding for this study was provided by The Pew Charitable Trusts and the Association of American Universities. The views expressed are those of the authors.



BEST COPY AVAILABLE

This study derives its theoretical framework from organizational theory in the area of organizational linkages. Weick, in particular, has established a number of important constructs related to linkages across organizational boundaries, most notably the concept of "loose coupling" (Weick, 1976). DiMaggio and Powell (1983) highlight the power and influence of "institutional isomorphism," the tendency of an organization to look to other similar organizations for examples of normative behavior and limits of legitimacy, the effect of which was to constrain the variance in organizational functioning and reduce innovation within an entire category of organization. Levitt and March (1988) expand this theoretical concept to broader notions of organizational learning and the effect of common meaning on such learning.

This paper also represents an example of what Weick calls "sensemaking" within organizations (Weick, 1995). Ring and Rands (1989) define sensemaking as a more private, singular activity in which individuals develop "cognitive maps" related to a particular phenomenon or environment. Little's work on the relationship between school norms and organizational functioning (1981) confirms the importance of sensemaking within schools and of shared definitions of teacher expectations for student performance. Conley [, 1998 #3880] and Spillane (1998) emphasize the importance of the sensemaking process by educators as they process state education policies.

Beyond these theoretical approaches to organizational functioning and meaning making, this study is informed by policy studies on organizational alignment, also known as policy coherence (Fuhrman, 1993). This conceptual perspective focuses on the signals sent to organizations from the policy environment, how organizations mediate and moderate these signals when the organizations are loosely coupled, and how the policy

system can facilitate alignment across institutional contexts and educational levels. Related work examines student transition from high school to college (Bragg & National Center for Research in Vocational Education Berkeley CA., 1999) and how states seek to establish connections between high schools and colleges [Conley, 2001 #6785].

## Methods of inquiry/data sources

This study derived its data from a series of eight meetings held at research universities that were members of the Association of American Universities (AAU). Meetings were held between January 2001 and January 2002. The universities that hosted meetings were, in chronological order, the University of Oregon, University of Iowa, University of Missouri, Rutgers University, University of California, Berkeley, University of Minnesota, University of Wisconsin, and the Massachusetts Institute of Technology. Faculty from a number of other AAU universities participated in these meetings, including Pennsylvania State University, New York University, Harvard, Brown, and five campuses of the University of California system. A total of approximately 400 people participated in these meetings. Faculty from six broad disciplinary areas were invited to attend. These were English, math, science, social sciences, second languages, the arts and humanities. This paper presents findings from English and math. Information on the remaining areas continues to be analyzed and will be available when the final results of this study are released in fall, 2002.

This study utilizes document and discourse analysis and a modified version of the Delphi method to ascertain group agreements on key knowledge and skills for university success. Multiple data sources were utilized, including focus groups, verbatim analysis of audiotapes, review of videotapes, analysis of participants' written comments on state

standards, analysis of work samples from college courses, and analysis of freshman course syllabi. Results were reviewed and refined in an iterative fashion as the meetings progressed in order to arrive at statements that were broadly representative of participants' perceptions and beliefs.

This methodology is employed in order to understand faculty perspectives on and definitions of success in higher education. Interestingly, and somewhat ironically, higher education faculty have not been consulted systematically on their views of needed knowledge and skills as states have rushed to develop content standards and assessments. The range of data sources analyzed in this study provides a relatively complete picture of how higher education faculty construct their expectations for students. Multiple measures allow for cross-referencing between faculty members' espoused expectations and their expectations in practice, as evidenced by student work samples and course syllabi, as well as providing multiple opportunities to triangulate findings among data sources.

Participants comprised "purposeful samples" (Patton, 1990) of individuals who taught freshmen or had a direct connection to the freshman program. Faculty were grouped by academic discipline, generally by English, math, science, social sciences, foreign languages, and humanities. Administrative faculty from departments including academic learning services, multicultural affairs, and admissions were integrated into the six disciplinary groups.

Data derived from the following sources:

a) *National Conversation meetings*. Eight meetings with approximately 400 total participants were conducted in which participants generated statements of key knowledge and skills by discipline. Trained facilitators (either a faculty from hosting institution or a

trained member of the project's staff) asked the following two questions within each group: 1) What content knowledge do students need to have to be successful in your entry-level course? 2) What are the more general cognitive skills that students need to be successful in your entry-level course (separate from specific content knowledge)?

b) *Review of student work samples.* Participants evaluated examples of student work submitted by faculty from participating institutions. They sought to determine if the work represented the key knowledge and skills for university success. Using a rating sheet, they scored work individually, then discussed work sample to compare judgments.

Each review session was audiotaped. Selected sessions were also videotaped. Facilitator notes were collected and analyzed. Facilitator notes were transcribed, as were audiotapes. Ratings sheets and comments were entered into a database.

c) *Web-based review of work samples.* After being reviewed at National Conversation meetings, work samples were posted for review by all participants in the National Conversation, then by other interested parties. The results of these wider reviews were used in combination with the National Conversation reviews to select exemplars.

d) *Collection and analysis of course syllabi.* University faculty from S4S participating institutions provided syllabi, assignments, and other artifacts from their entry-level courses. Content analysis was the primary means utilized for identifying themes and categories that were embedded in the data collected from the National Conversations. Participants analyzed work samples by means of a rating sheet that also contained fields for comments. Participants also reviewed and critiqued state academic content standards for between one and three states, generally including the state in which

the meeting was being held as well as states from which the hosting university drew students. Responses were analyzed to determine trends in terms of topics preferred as well as characteristics of the state standards participants deemed desirable or undesirable. Project staff conducted topical analyses of course syllabi to ascertain what was being taught in the courses. In addition, where the course utilized a specific text, the course syllabus was cross-referenced to the text's table of contents to ascertain content coverage in greater detail.

### *Data analysis process*

Data from each National Conversation were first converted into electronic formats and posted on a password-protected website. Participants were notified when data from their meeting were available for review. Comments from participants were used to clarify and correct the raw data for each meeting. At least two trained staff reviewed all transcripts and notes and transformed the raw data into categories, which were triangulated against other data sources. Results were accumulated from the first five National Conversations and were utilized to develop an initial draft of key knowledge and skills. This preliminary draft was used as the starting point for discussions at the subsequent three National Conversations. After each of these meetings, changes suggested by participants were made in the draft documents.

Once all eight meetings were concluded, the draft documents were sent to two external groups for review and revision. First, they were reviewed by consultants at Mid-continent Research for Educational Learning, a national educational research laboratory sponsored in part by the U.S. Department of Education and the acknowledged leader

nationally in content standards development. The review was conducted under the guidance of John Kendall, author of the definitive publication on K-12 content standards.

Subsequent to this review, the revised documents were reviewed by members of content review panels constituted in each subject area. These panels consisted of five faculty members who had participated in a National Conversation, who were deemed to be credible representatives of their discipline on the basis of their rank and assignment in their institution, and who expressed an interest in participating further in the creation of key knowledge and skills. Some of these individuals had previous experience developing content standards at the state and national level.

The panels received the revised versions of key knowledge and skills statements. Since each member of the content review panel critiqued the same materially individually and separately, it was possible to determine when convergence was being reached among panel members. In general, this occurred when review panel members had few comments or had similar comments and recommendations for changes. This point was reached for math and English in the late fall of 2001. This increasing agreement by panel members was preceded by convergence that was occurring at each of the final three National Conversation meetings where participants were reviewing draft documents updated to reflect previous recommendations. This process represents a modified form of the Delphi method (Linstone and Turoff, 1975), a technique used to determine when agreement exists among a broad range of experts on a particular topic.

## Preliminary results

The results are presented in two sections; 1) summary statements and generalizations about the key knowledge and skills produced, 2) generalizations about the process and participation by faculty in the process.

The following section contains the key knowledge and skills statements of content knowledge that emerged in English. Following the list of knowledge and skills is a summary of the broader cognitive skills that were identified for English. This is followed by the same information for mathematics. These statements all refer to knowledge and skills needed to succeed in freshman-level university courses and not to high school exit standards or coursework.

### *English*

Key knowledge and skills for English were grouped under three broad headings. For each, an additional level of detail was also developed. To review the entire set of standards, refer to Appendix A.. The major category headings for these three sections are:

*Key Knowledge and Skills*

***I. WRITING***

IA. The student will know basic grammar conventions

*IB. The student will know conventions of punctuation and capitalization*

*IC. The student will know conventions of spelling*

*ID. The student will write clearly and coherently*

*IE. The student will write to communicate with the reader*

*IF. The student will use a variety of strategies to revise and/or edit written work*

***II. READING AND COMPREHENSION***

*IIA. The student will use reading skills and strategies to understand literary and*

*IIB. The student will understand the defining characteristics and techniques of a variety of literary forms and genres*

*IIC. The student will be familiar with a range of world literature*

*IID. The student will understand the relationships between literature and its context*

***III. RESEARCH SKILLS***

*IIIA. The student will understand and use research methodologies*

*IIIB. The student will know how to find a variety of sources and use them properly*

These general headings do not necessarily convey well the depth of knowledge and skill expected in these areas. Appendix A contains the complete key knowledge and skill statement that includes between one and seven additional statements for each of the subheadings listed above. These illustrate more clearly the level of challenge and competence expected for success in entry-level university courses. The narrative section, which follows, contains additional information to describe in greater depth what is expected in English.

*English narrative*

The narrative section is a summary of key points made in focus groups and contained in written comments. The purpose of the narrative section is to develop greater depth of understanding of what is meant by the statements of key knowledge and skills summarized previously. The narrative section also contains descriptions of the broader cognitive skills and personal attitudes faculty members felt were important for success in

their classes. The following summarizes the major categories into which the narrative section is organized. The complete narrative along with embedded quotes from participants can be found in Appendix B.

*Content or Technical Skills*

- Familiarity with English and worldwide literature
- Familiarity with literary formats
- Mechanics of writing and grammar conventions
- Writing skills
- Editing and revision skills:

*General Cognitive Skills*

- Reading skills
- Critical reading skills
- Comprehension skills
- Note taking and listening skills
- Analytical skills
- Critical thinking skills
- Connective intelligence
- Research skills
- Knowing how to formulate opinions and expressing and trusting one's original opinion
- Awareness and understanding of history vis-à-vis literature:
- Awareness and sense of geography:

*Attitudes Toward Learning*

- Intellectual curiosity/maturity
- Openness
- Showing patience and perseverance.
- Time management and organization skills
- Understanding of academic expectations:

***Mathematics***

Mathematics key knowledge and skills follow the same format as English. First is the list of general categories into which key knowledge and skills are grouped, followed by the major headings of the narrative. As with English, additional levels of detail and content of narrative can be found in the appendix section in Appendix B.

*Key Knowledge and Skills*

***I. COMPUTATION***

*IA. The student will know basic mathematics operations*

*IB. The student will know and carefully record symbolic manipulations*

*IC. The student will know and demonstrate fluency with mathematical notation and computation*

***II. ALGEBRA***

*IIA. The student will know and apply basic algebraic concepts*

*IIB. The student will use various techniques to solve basic equations and inequalities*

*IIC. The student will be able to recognize and use basic algebraic forms*

*IID. The student will understand the relationship between equations and graphs*

*IIE. The student will know how to use algebra both procedurally and conceptually*

*IIF. The student will demonstrate ability to algebraically work with formulas and symbols*

***III. TRIGONOMETRY***

*IIIA. The student will know and understand basic trigonometric principles*

***IV. GEOMETRY***

*IVA. The student will know synthetic (i.e., pictorial) geometry*

*IVB. The student will know analytic (i.e., coordinate) geometry*

*IVC. The student will understand the relationships between geometry and algebra*

*IVD. The student will understand the relationships between geometry and trigonometry*

*IVE. The student will demonstrate geometric reasoning*

*IVF. The student will be able to combine algebra, geometry, and trigonometry*

***V. MATHEMATICAL REASONING***

*VA. The student will demonstrate an ability to solve problems*

*VB. The student will understand various representations of mathematics (e.g., verbal, pictorial, abstract)*

*VC. The student will demonstrate a thorough understanding of mathematics used in applications*

*VD. The student will demonstrate strong memorization skills*

*VE. The student will know how to estimate*

*VF. The student will understand the appropriate use of technology*

*VG. The student will be able to generalize (e.g., to go from general to abstract and back and to go from specifics to abstract and back)*

*VH. The student will be willing to experiment with mathematics*

*VI. Student will emphasize process over mere outcome(s)*

*VJ. The student will show ability to modify patterns and computations for different situations*

*VK. The student will use trial and error to solve problems*

*VL. The student will understand the role of mathematics*

*VM. The student will use mathematic models*

*VN. The student will understand that s/he needs to be an active participant in the process of learning mathematics*

*VO. The student will understand that mathematics is a symbolic language and that fluency requires practice*

***VI. STATISTICS***

*VIA. The student will understand and apply concepts of statistics and data analysis*

### Mathematics Narrative

The mathematics narrative, like the English narrative, provides additional insight into what is meant or implied by the key knowledge and skills identified previously. The

narrative also touches on areas not specifically listed in the key knowledge and skills. A listing of the areas into which the narrative was organized follows:

- Know basic mathematical concepts
- Understand mathematics as an inquiry process
- Write in concise and clear manner
- Solve problems:
- Using technology appropriately

### *Analysis of work samples from English and mathematics*

The data from work sample scoring sheets and from audio-taped conversations initially showed strong variability in faculty judgment of student work. However, as more examples were reviewed, consensus began to emerge. Student writing that elicited clarity of structure, consistent use of conventions, interesting or insightful observations, and knowledge of subject matter was consistently judged as meeting standard. Mathematical work that was accurate, demonstrated understanding of the concept, employed a novel or efficient method of solving a problem, and avoided small errors met approval broadly.

The project is currently engaged in a process of connecting work samples with key knowledge and skill statements to provide illustrations of what is meant by each statement in terms of the work expected of students. This work should be completed by the end of summer 2002.

## Process issues findings from the National Conversations

This section provides a summary of issues and findings related to the process of conducting these meetings. These findings derive from transcript analysis of taped

sessions. They focus on the ways in which participants perceived the process of identifying key knowledge and skills for university success.

Organizing these meetings proved much more challenging than anticipated. Although faculty comment frequently and with great feeling about the deficiencies in the preparation of incoming freshmen, they appear to be equally cynical that anything can be done to improve preparation substantially. This process encountered reactions of this nature as it vied for the time and attention of faculty who were extremely busy people.

This initial reluctance to participate in what appeared to be yet another discussion about a large problem that needed improvement often diminished for those who did attend the meetings and had the opportunity to interact with colleagues from their discipline as well as others who had opinions on or insights into freshman preparation. The grounded nature of the discussion proved to be very important. By maintaining a clear focus on performance of freshmen in entry-level courses, the discussion drew an important distinction between what goes on in universities and what goes on in high schools. This focal point helped keep the conversations from drifting in the direction of criticizing high schools. When this did occur, facilitators or even participants would refocus the conversation on what was actually occurring in university courses.

When conversations did focus on high school preparation, they tended to move to high levels of generalization, whereas a focus on university courses tended to elicit more specific examples and illustrations as well as greater complexity in terms of describing what was desired from students. The need to remain focused on what students actually do in university courses helped steer the conversations away from creating the "ideal" student, which was a strong tendency when the focus was high school preparation.

Reviews of student work samples were also powerful means of focusing the conversation. Since the work samples came from classes at either the host institution or another AAU university, they had high validity and clear grounding. Participants, however, did not hold back because work samples came from their home campus. They tended to be quite critical of work samples generally, finding few that met their standards unconditionally. Simultaneously, the reflected upon their own teaching and grading techniques, the assignments they were requiring, and how some of their own practices might be interpreted in ways they did not intend. They realized that expectations and grading practices could be tremendously inconsistent across their institution, and even between two classes with the same title in their own department. They reflected upon the ambiguity of expectation created by an assignment that was not clearly worded as well as the need to provide guidance to students subsequent to assignments being made.

Faculty tended to leave these meetings with a clearer sense of the importance of communicating with secondary education to ensure that students come in with adequate academic foundations and understanding of college expectations. They were particularly critical of state academic content standards from a number of states, which they felt would not develop the kinds of cognitive and intellectual skills that they valued and that they sought to develop in their classes.

These meetings also brought to light how little faculty knew about their state's standards and assessments. Few had any first-hand involvement with state standards, and most develop their opinions via their children's experiences or newspaper accounts. These sources led toward more negative impressions of state standards and a general feeling that state tests were designed to "dumb down" the curriculum, that they tested

rote memorization and lower level cognitive skills primarily, and that results from these tests would be of little use to universities.

Faculty had difficulty reviewing state standards because they were unfamiliar with the formatting of standards documents, the meaning of standards language employed in the documents, and because they needed much more specificity and examples of what level of challenge was being expected for any given standard. The single most common critique of state standards were that they were "too general," or "vague." Those standards that did receive more positive reactions tended to be quite clear in their expectations (as in the sciences) or expressive of higher level cognitive goals with an implication that teachers would have discretion to determine how best to meet the standard (as in English). These sorts of differences in reactions across disciplines tended to be relatively consistent from meeting to meeting.

Faculty members do not think in the language of state standards, nor do they express themselves easily or willingly in such terms. It was much easier to get faculty to describe the more general cognitive skills and intellectual habits of mind they felt were important than to have them specify the content knowledge they thought students needed to have mastered. This manifested itself on more than one occasion by a participant saying that it didn't matter what students knew as long as they knew how to think. Some went so far as to say that they preferred students not to have any knowledge at all in their subject area so that the faculty did not have to disabuse students of false impressions they had formed based on inaccurate understandings of previous study in the subject area. While these more extreme statements often were not upheld if challenged, they were nevertheless presented in almost every meeting and in more than one subject area.

Another unexpected finding was that faculty expectations were very similar across a wide range of research universities, ranging from public institutions with very non-selective admissions policies to private universities among the most selective in the nation. The problems that faculty faced in terms of freshman preparation were remarkably similar among these institutions, particularly in terms of the intellectual maturity shown by students, but also in terms of specific deficiencies in content knowledge.

## Discussion

These results lead to several general conclusions:

1) Although difficult to do, it does appear to be possible to develop statements of key knowledge and skills for university success that reflect broad agreement among faculty at a range of institutions. The language in such statements are not the natural language of higher education faculty, but represent "translations" of criteria expressed by faculty.

2) The content knowledge standards proposed by higher education faculty do not appear to be dramatically different from what states are expecting in their standards systems. However, this apparent superficial agreement masks deep differences in the type of intellectual development that should accompany the mastery of content knowledge.

3) Higher education faculty are accustomed to applying a critical eye to any problem or study. That tendency predisposes faculty to an initial skepticism regarding projects that seem large, ambitious, and relatively abstract. Big "improvement" processes must be carefully grounded and be able to make concrete connections between what participants are being asked to do or contribute and the solution or action that will result.

In the case of this project, keeping discussions focused on the university itself rather than the larger policy environment seemed helpful, as did review of student work from the host university or a comparable institution.

4) University faculty are eager for students who exhibit a range of behaviors and attitudes that indicate interest and engagement in learning beyond simply mastering academic content. They value students who are inquisitive, analytic, critical, and who are willing to take risks, move beyond the boundaries of their safety zones to explore and even to fail at times. They find relatively few students who possess these characteristics or who seem particularly interested in developing them within their postsecondary experience. State academic content standards do not explicitly address many of these goals.

5) This process has highlighted the lack of explicit standard setting within universities at the one place where such standards could be most logically established—entry-level courses in the core subject areas. Given the higher rates of failure in these courses compared to the rest of the university curriculum, these courses seem to be strong candidates for the establishment of explicit statements of prerequisite knowledge and skills. Such statements would be useful in formal placement processes as well as enabling students to determine to some degree their readiness to succeed in entry-level courses.

6) While the standards for success in higher education align at least superficially with what states seek to have students master in high school, higher education faculty either were not involved in the process of establishing state standards or at the least have not been well informed on the process. As a result, the always-tenuous link between college preparation and success in college appears to have been weakened rather than

strengthened by most states' actions to set and test academic content standards. Engaging higher education faculty in the process at this point will be challenging, given that many have reached conclusions based more on impressions than data.

### *Standard setting as a means to promote policy coherence*

The process of establishing key knowledge and skills for university success is an example of what Fuhrman (1991) labels "policy coherence." American education is one of the most decentralized systems in the world. One of the side effects is that different levels of education are governed entirely independently of other levels. As a result, policies adopted at one level may or may not be consistent with policies adopted at another level.

Policy coherence occurs when consistent messages are sent across multiple educational levels. Coherence is evidenced by procedures that are compatible and programs that are aligned. Academic content standards in the K-12 system are an attempt to create policy coherence within public schools. Higher education has not been a party to standards development in most states, and no state's standards connect directly with college admission criteria, which continue to be expressed in terms of required courses, class rank, and grade point average. If K-12 standards are to create alignment among educational levels within the public school system, a way must be found to align these standards with university expectations. If such an accommodation is not reached, one of two things is likely to occur. Either students will learn and be tested on one body of knowledge and skills in high school and a differing set in college or colleges will over time come to accept on a de facto basis that students are being prepared based on the state standards and colleges must adjust their expectations and coursework accordingly.

The development of standards keyed to postsecondary success could have an important triggering effect on states if states move to align their standards with higher education's standards. Similarly, higher education standards may create the potential for negotiations between the two systems and a mutual accommodation may be reached where each system adapts its expectations in relation to the other's. Either of these results would facilitate and promote policy coherence as experienced by high schools and colleges. In this sense, higher education standard setting is an example of an activity with the potential to promote policy coherence.

***How are faculty standard setting activities an example of sensemaking?***

Weick (1995) identifies seven properties of sensemaking. It is a process that is best understood as being 1) grounded in identity construction; 2) retrospective; 3) enactive of social environments; 4) social; 5) ongoing; 6) focused on and by extracted cues; and 7) driven by plausibility rather than accuracy. This process of standard setting illustrates many of Weick's sensemaking properties. This section briefly discusses sensemaking, then reviews several of the ways in which the development of key knowledge and skills for university success reflected facets of organizational sensemaking.

Sensemaking exists when someone in an organization notices something in the normal flow of events that is surprising, that does not fit. This initial perception that something is not quite right is confirmed as the person looks back over experiences and perceives a pattern, which leads to the generation of plausible explanations, the sharing of the explanations publicly in credible forums or published forms. Normally, this initial speculation about a new way to understand a phenomenon in the organizational context

do not generate widespread attention right away because many members of the organization do not have social contacts with the experiences or individuals that are being commented upon. Finally, the organization tends to deny the formulation of new understanding in part because of the barriers to "passive social intelligence about hidden events." Experts in the organization overestimate the probability that they would surely have known about the phenomenon if it were real, what Westrum (1982) describes as the "fallacy of centrality": if I don't know about it, it can't be happening. This stance not only discourages serious investigation of a phenomenon but also elicits in the expert or authority an antagonistic reaction toward the event being described.

Although some may argue the degree to which universities are well-integrated organizations, they do represent what Czarniawska-Joerges (1992) describes as "nets of collective action." Faculty perform a series of specialized tasks intended to educate students. Faculty have shared understandings of their roles, expertise, and stature, but they also act as shifting coalitions of interest groups. Through a series of prevailing routines and generic understandings of roles, personnel are relatively interchangeable, although their specific expertise varies.

The important point, Weick says, is that all of this organizing to facilitate common action imposes an "invisible hand" on sensemaking. Heavily networked organizations might actually find that the dense connections produce an unexpected liability, in the form of the fallacy of centrality. Insights into organizational functioning and the problems and challenges the organization faces may be discounted because those hearing it may assume if they are hearing it second or third-hand, it is not credible, because they personally would have heard it earlier it if were truly credible, given their

expertise and deep understanding of the organization. This results in the ironic situation that the better the information systems are in an organization, the less sensitive these systems are to novel events and new insights.

Similarly, the language used affects sensemaking. When organizations use words that are indirect and bland or that turn the attribution arrow around, they deflect attention from problems and novel situations. Organizations that can use vivid terms to describe new insights or phenomena will be able to adapt sensemaking more readily than those that limit their official vocabulary and that muddy their reporting of phenomena.

1) *Sensemaking is grounded in identity construction.* Sensemaking occurs "in the service of maintaining a consistent, positive self-conception" (Weick, 1995). This characteristic of sensemaking can be witnessed in the ways that participants tended to attribute problems with students to the students themselves or their preparation. Some participants did use the occasion to reflect upon the nature of the university courses themselves, but most found an external focus for the problems they believed existed in their students. This is consistent with the observation that sensemaking tends to serve to maintain the positive self-concept of the individual. Individuals participating in National Conversations were acting both as individuals and as representatives of the collective. Their statements were representations of personal values but also presented a form of agency for the organization, what Chatman et al. (1986) describes as acting "as the organization. In this sense, individual expression represents a more "macro" perspective than might be apparent. The individual is the personification of the organization in this arena of establishing its standards of quality.

2) *Sensemaking is retrospective.* In short, sensemaking is derived from the analysis of "meaningful lived experience." Individuals reflect upon their cumulative experiences in the organizational context when interpreting perceived problems or discontinuities. This conception carries deep psychological associations in terms of the kind of attention the Ego gives to lived experiences. In the context of standard setting, reflection is the manifestation of the retrospective nature of sensemaking. This retrospection is difficult in environments in which multiple projects are under way that compete with the reflective process. Sensemaking is a synthesizing process that attempts to extract one meaning when many possible ones exist. The problem is more equivocality than uncertainty, confusion rather than ignorance.

Faculty faced this challenge as they attempted to extract and isolate key knowledge and skills for success from the broader array of factors and forces that operate on students and on the institution at large. The fact that faculty have multiple projects ongoing simultaneously at any given moment, and these align to varying degrees with organizational priorities, and sometimes not at all with teaching responsibilities, creates a perspective based on experience that is complex and at times contradictory. The assertion that students might be better of if they did not acquire specific content knowledge in high school is an example of a statement borne of a retrospective sense of sensemaking where "hindsight bias" may be operating. Weick describes this phenomenon: "People who know the outcome of a complex prior history of tangled, indeterminate events remember that history as being much more determinant, leading 'inevitably' to the outcomes they already knew."

3) *Sensemaking is social.* Sensemaking is never solitary, says, Weick, and the focus group method in particular helps to bring issues of sensemaking into sharp relief. Education organizations, in particular, rely on social interaction to construct meaning. Talk *is* the work in education (Gronn 1983). However, faculty have few forums in which to construct meaning. Informal interaction and shared anecdote come to predominate as the means for interpreting phenomena and defining problems in the organization.

The focus groups conducted by Standards for Success provided faculty with an unusual opportunity to interact and compare perceptions. Participants proved adept at incorporating a wide range of perceptions while still reaching agreement on certain core concepts. This process asked faculty not to focus on what high schools ought to do to prepare students, but on what the actual skills were that students needed to succeed in entry-level university courses at the faculty's university. Few participants in the National Conversation meetings had thought about it previously in these terms.

The significance of this sort of activity is that shared meaning is not the critical prerequisite for collective action. What is crucial is that the collective action is shared. In this sense, these meetings were potentially important organizational milestones in that they represented forums for experiencing a form of shared collective action.

4) *Sensemaking is focused on and by extracted cues.* In essence, people make sense of their world by drawing cues from it, accurate or otherwise. The most important thing may simply be to have a map, rather than having a perfectly accurate map. If that map serves as the basis for extracting additional cues and updating perceptions, then it may be entirely adequate.

In this sense, this exercise in standard setting need not be entirely perfect or accurate to still be of considerable use. It represents a logical starting point for charting a journey toward a goal, namely, better prepared students, a goal that is elusive, complex, and multivariate. Having established a starting point, the organization has "mapped" the terrain and established the scope of the challenge. If the organization refers to this initial map frequently, it has a reference point for judging subsequent cues.

What, then is needed in the final analysis for sensemaking? Weick (1995) states that accuracy is not the key element. More important is

> …something that preserves plausibility and coherence, something that is reasonable and memorable, something that embodies past experience and expectations, something that resonates with other people, something that can be constructed retrospectively but also can be used prospectively, something that captures both feeling and thought, something that allows for embellishment to fit current oddities, something that is fun to construct. (pp. 60-61)

Standard setting, as represented by the process conducted by Standards for Success, models many of these aspects of sensemaking in organizational contexts. Conversely, the notion of sensemaking helps explain many of the behaviors of participants in the process.

## Conclusion

This study represent the first and only comprehensive statement of university entrance-level skills that is presented in a standards-like format, rather than in terms of required courses or course content or broad generalizations. This information can be useful to states as they seek to develop better standards and to align their assessments more closely with university entrance expectations. Given that few states paid much

attention to university requirements as standards and assessments were developed, it seems likely that as these systems begin to influence high school instruction, states will wish to remedy this oversight, if for no other reason than to cause students to take state assessments seriously. State assessments are beginning to take hold and drive teaching, often in ways that are not considered to reflect the complexity of the learning process. Findings presented in this study tend to confirm that a gap exists between what states are testing and what major research universities seek in well-prepared students. This insight can help generate a more informed debate about what states really want from their standards and assessment systems.

A second potential result of this study is its potential to enable high school teachers to raise their expectations for students. These results can serve to clarify what high school students must really do "because they'll expect you know this in college," as many a high school teacher has intoned to students seeking a reason to complete an assigned task. Given the large proportion of students who go on to college (at least 63 percent including those who go to community colleges), anything that can be done to make the college preparatory program more challenge and more accessible simultaneously has the potential for broad effects. The effects can potentially be most dramatic at inner-city schools where the gap between high school grades and college performance is the most dramatic, as documented by differences in grades of urban and suburban students with comparable NAEP scores.

These findings may also help universities to gauge the discrepancy or match between what they say they want their incoming students to be able to do and what actually occurs in their freshman programs of study. These broadly generalizable findings

extend beyond any individual institution and can serve as a valuable resource for campuses as they review their general education programs of study. Universities as organizations find it difficult to create coherence within the general education portion of the baccalaureate, reflecting what Cohen and March have referred to as the "organized anarchy" that characterizes university governance structures. Universities may endorse these key knowledge and skills with the intent of sending a message to high schools. However, universities may find that the standards serve well as a means for discussions and standard setting within their own institutions. Simply deciding what it is that universities are attempting to achieve via the general education curriculum would be a step forward at many institutions.

The study makes also makes a contribution to the extremely limited research base that exists on the topic of the connections between high school and college expectations. Most studies in this area seek to examine the effects of course requirements or completion of various courses of study on college performance. Few explore the perceptions of faculty or analyze the actual practices taking place in college classrooms.

If American high school classrooms are being influenced by state standards and assessments, it is increasingly important to create some alignment between those standards and the expectations and standards of universities so that the energy students and teachers expend meeting in college preparation results in students who are capable of succeeding at college and benefiting fully from what a college education has to offer. This understanding of differential expectations is also important to policy makers who oversee standards systems and their evolution. And finally, greater understanding of these

phenomena is important to researchers who seek greater insight into issues of organizational sensemaking and alignment.

## Appendix A: Key Knowledge and Skills for English

### *I. WRITING*

IA. The student will know basic grammar conventions

- IA.1. Identify parts of speech correctly and consistently: nouns, pronouns, verbs, adverbs, conjunctions, prepositions, adjectives, interjections
- IA.2. Use subject-verb agreement and consistent verb tense
- IA.3. Use and distinguish between different type of clauses and phrases: adverb clauses, adjective clauses, adverb phrases

*IB. The student will know conventions of punctuation and capitalization*

- I.B.1 Use commas with nonrestrictive clauses and contrasting expressions
- I.B.2. Use semicolons between independent clauses
- I.B.3. Use ellipses, colons, hyphens, apostrophes correctly

*IC. The student will know conventions of spelling*

- IC.1. Use a dictionary and other resources to spell new, unfamiliar, or difficult words
- IC.2. Differentiate between commonly confused terms: "its" and "it's", "affect" and "effect"
- IC.3. Know how to use the spellchecker function in word processing software and know the limitations of relying upon a spellchecker.

*ID. The student will write clearly and coherently*

- ID.1. Know and use several prewriting strategies: develop a focus, determine the purpose, plan a sequence of ideas, use structured overviews, create outlines
- ID.2. Use paragraph structure in writing: construct coherent paragraphs, arrange paragraphs in logical order
- ID.3a Use a variety of sentence structures in writing: compound, complex, compound-complex, parallel, repetitive, analogous
- ID.3b Use strategies to adapt writing for different audiences and purposes: include appropriate content; use appropriate language, style, tone, and structure; consider audience's background
- ID.4. Organize ideas to achieve cohesion in writing
- ID.5. Use writing conventions and formats: style sheet methods such as MLA, APA; bibliography of sources

ID.6. Use personal style and voice in writing

ID.7. Use words correctly. Use words that mean what the writer intends to say.

*IE. The student will write to communicate with the reader*

IE.1. Know the difference between a topic and a thesis: state how a topic relates to advancing a thesis (evidence, example, counterargument)

IE.2. Articulate a position through a thesis statement and defend it

IE.3. Use a variety of methods to develop arguments: use comparison-contrast reasoning; develop and sustain logical arguments (inductive-deductive); oscillate between the general and the specific (make connections between public knowledge and personal observation and experience)

IE.4. Write to persuade the reader: anticipate and address counter arguments, use rhetorical devices, develop accurate and personal style of communication (move beyond mechanics, add flair and elegance to writing)

IE.5. Distinguish between formal and informal styles: formal paper, personal reflections, informal letters, memos

IE.6. Use strategies to write expository essays: include supporting evidence, use information from primary and secondary sources, use visual aids to organize information, anticipate and address reader's biases and expectations, use technical terms and notations

IE.7 Use strategies to write fictional, autobiographical, and biographical narratives: develop point of view and literary elements, present events in logical sequence, convey a unifying theme or tone, use concrete and sensory language, pace action

IE.8 Use appropriate strategies to write personal and business correspondence: appropriate organizational pattern, formal language and tone

*IF. The student will use a variety of strategies to revise and/or edit written work*

IF.1. Review ideas and structure in substantive ways, improve depth of information, logic of organization, rethink appropriateness of writing in light of genre, purpose, and audience

IF.2. Use feedback from others to revise own written work

## *II. READING AND COMPREHENSION*

*IIA. The student will use reading skills and strategies to understand literary and informational texts*

IIA.1. Understand vocabulary and content: subject-area terminology, connotative and denotative meanings, idiomatic meanings.

IIA.2. Use monitoring and self-correction methods: reading aloud

IIA.3. Engage critically with the text: annotating, questioning, agreeing or disagreeing, summarizing, critiquing, formulating own responses

IIA.4. Understand narrative terminology: author versus narrator, historical versus implied author, historical versus actual reader

IIA.5. Use reading skills and strategies to understand a variety of literary texts: epic piece (Iliad) or lyric poem, narrative novels, newspapers, and philosophical pieces

IIA.6. Understand plot and character development in literary works, including characters' motives, causes for actions, and the credibility of events

IIA.7. Use reading skills and strategies to understand a variety of informational texts: instructions for software, job descriptions, college applications, historical documents, government publications

IIA.8. Understand basic beliefs, perspectives, and philosophical assumptions underlying an author's work: point of view, attitude, or values conveyed by specific use of language

IIA.9. Use a variety of strategies to understand the origins and meanings of new words: analyzing word roots and affixes, recognizing cognates, using context clues, determining word derivations

IIA.10. Make supported inferences and draw conclusions based on text features: evidence in text, format, language use, expository structures, arguments used

*IIB. The student will understand the defining characteristics and techniques of a variety of literary forms and genres*

IIB.1. Know the salient characteristics of major literary texts and genres: novels, short stories, horror stories, science fiction, biographies, autobiographies, poems, plays, etc.

IIB.2. Distinguish the formal constraints of different types of texts: Shakespearean sonnets versus free verses

IIB.3. Understand literary devices used to influence the reader and evoke emotions: imagery, characterization, choice of narrator, use of sound, formal and informal language.

IIB.4. Understand the effects of author's style and literary devices on the overall quality of literary works: allusions, symbols, irony, voice, flashbacks, foreshadowing, time and sequence, mood

IIB.5. Know archetypes, such as universal destruction, journeys and tests, banishment, that appear across a variety of literary texts: American literature, world literature, myths, propaganda, religious texts

IIB.6. Understand themes such as initiation, love and duty, heroism, death and rebirth, that appear across a variety of literary works and genres

IIB.7. Evaluate literary works based on ambiguities, subtleties, contradictions in a text; based on aesthetic qualities of style, such as diction or mood

*IIC. The student will be familiar with a range of world literature*

IIC.1. Have some familiarity with British literature

IIC.2. Have some familiarity with world literature translated into English: colonial and post-colonial authors

IIC.3. Have some familiarity with major literary works of American and British authors

IIC.4. Have some familiarity with major literary works of Nobel Prize winners and major canon writers

*IID. The student will understand the relationships between literature and its context*

IID.1. Know major historical events of the 20th century

IID.2. Understand influences of historical, social, and economic contexts on literary texts: the influence of historical context on form, style, and point of view; social influences on author's descriptions of character, plot, and setting

IID.3. Understand the relativity of all historical perspectives, including the one in which one operates

IID.4. Understand the relationships between literature and politics: the political assumptions underlying an author's work, the impact of literature on political movements and events

IID.5. Places historical claims in their diachronic and synchronic context and contrast successive epochs

*IIIA. The student will understand and use research methodologies*

IIIA.1. Formulate research questions (S4S), refine topics, develop a plan for research, and organize what is known about the topic

IIIA.2. Use appropriate research methods: interviews, field studies, experiments

*IIIB. The student will know how to find a variety of sources and use them properly*

IIIB.1. Collect information to narrow and develop a topic and support a thesis

IIIB.2. Understand the difference between primary and secondary sources

IIIB.3. Use a variety of primary and secondary sources, print or electronic: books, magazines, newspapers, journals, periodicals, Internet

IIIB.4. Critically evaluate sources: discern the quality of the materials, qualify the strength of the evidence and arguments, determine credibility, identify bias and perspective of author, use prior knowledge to evaluate information

IIIB.5. Use sources to write research papers: integrate information from sources, logically introduce and incorporate quotations, synthesize information in a logical sequence, identify different perspectives, identify complexities and discrepancies in information, offer support for conclusions

IIIB.6. Understand the concept of plagiarism and how to avoid it: paraphrasing, summarizing, quoting

## Appendix B: Narrative for English

The following narrative section consists of summaries of key points made in focus groups and written comments. They are presented to develop greater depth of understanding of what is meant by the statements of key knowledge and skills presented above. The narrative section also contains descriptions of the broader cognitive and metacognitive skill faculty members felt were important for success in their classes. Included in the narrative are verbatim quotes from participants that illustrate the knowledge or skill being described.

## Narrative of key cognitive and metacognitve skills in English

***Familiarity with English and worldwide literature:*** Students who are familiar with world literature(s), including US and British authors, literary works from cultural traditions other than European, women authors, are more apt to benefit from introductory literature courses. Faculty agreed that students need exposure to non-literary sources, as well, for example, the Bible, or the Declaration of Independence, in order to broaden their understandings of the range of writing from which their courses will draw.

*In their own words*
***Students should have read English, American, and world literatures and know many of the important authors and key works. They should be able to identify literature by country of origin.***

***Familiarity with literary formats***: Faculty want students to be able to distinguish among language registers and text types, for example, that a biography is not a novel. They expect students to be able to identify what differentiates one genre from another and to be more familiar with plays and poetry.

***Mechanics of writing and grammar conventions***: Faculty indicated the importance of an understanding of grammar as a foundational skill for writing. When reviewing work samples, faculty often point out grammatical errors, such as a "comma splice", as well as students' work that demonstrates a command and understanding of writing conventions, such as the "good closing" of a paragraph or paper. The lack of knowledge of sentence structure (subject, verb, noun) and of agreement can be barriers to good writing. Diagramming sentences is a tool students can use to understand words and their functions, and how they relate to one another. Students need to understand how correct grammar contributes to better comprehension and communication of a written piece.

> In their own words
> *The purposes for which a writer writes, the ethos or credibility of the writer. If it's a sonnet, what is imagery, what is metaphor, what is figurative language? Style should be appropriate to the discourse. Understand the presuppositions behind a text, who the*

> In their own words
> *Students should know basic grammatical terminology: parts of speech, distinguish clauses, phrases. I think of mechanics as a subset of writing skills. I think of elegance of language, available vocabulary and flair as a little bit different than mechanics and grammar.*

***Writing skills***. Faculty mentioned the importance of "coherence" (and the frequent lack thereof) to describe their students' writings. They expect students to use language to express their ideas, not simply to tell events, and to think rhetorically when they write; that is, to think about the audience for whom they write beyond the teacher, about the evidence they use to support their ideas, about their overall argument, and the purposes for which they write. Students should know how to write an essay. This implies the following:

> In their own words
> *My major problem consistently is structure. They just start writing without thinking of where they're going and how to get there. A little bit of clear thinking begins with clear writing and not the other way around.*

Be able to write an outline of one's paper and use the outline as one writes to develop a more detailed structure and follow it. Some faculty require students to include their outline with their written works.

Make an argument and take a position responsibly by supporting one's argument and understanding the consequences of taking a particular position.

***Editing and revision skills***: English faculty described students who seem neither willing nor able to edit their works. First, students rely almost exclusively on the computer spell checker and lack the ability to use references, such as a dictionary or a thesaurus. Second, students need to value the importance of revision and re-writing to improve their writing abilities and, consequently, their grades. Faculty expect students to understand the purpose(s) of editing, that it is the most important part of their writing process and that going through various drafts before a finished product is rather routine for a college-level assignment, and actually a good thing.

*In their own words*
***The spell checker has replaced learning to spell. And has made their spelling grotesque when they don't have a spell check. So, in light of this discussion. I would add understand the possibilities and limits of spell check.***

## General Cognitive/Foundational/Process Skills

***Reading skills:*** Faculty expect students to recognize the value of reading and understand how it closely connects what they read to their writing and thinking skills. For the most part, students read in a "mechanical manner" where they need to be reading with discernment and with the understanding that reading can help improve their performance. In

*In their own words*
***Students think that they can read, but what they mean by reading is really quite different from what they need to do for reading. They do a kind of speed-reading. Reading for students means their eyes start at the top of the page. They find a point sometimes later when their eyes have made it to the bottom of the last page. They have no idea what happened in between. They just have this memory that their eyes were at the beginning, they're now at the end, so they must have had something happen in between.***

other words, faculty want students to know how to read using active reading strategies such as annotations, summaries and critiques, so that they read to understand materials.

***Critical reading skills***: Students need to know how to infer and to recognize a worthy thesis and how it is being constructed. Faculty expect students to understand that reading is an interactive performance, one you engage in so that experiential and literary connections can be made.

*In their own words*

*Written communication needs structure, emphasis, priorities: students need more than bullets, they need to order importance of information (Shakespeare vs. Seinfeld).*

Students should be able to answer such questions as "How does this text make you feel? What made you feel this way? And be able to agree or disagree with a text.

***Comprehension skills***: Faculty want students to be able to paraphrase their reading assignments, an exercise that involves a certain level of attentiveness (what certain faculty call "reading comprehension") to the readings and an understanding of the various possibilities of words, i.e. that words "have connotations and denotations." As they comprehend the material they are exposed to, students are then able to make decisions as to which piece of information is important and relevant to their current assignment.

*In Their Own Words*

*Attentiveness in reading, ability to isolate particular words and think about their denotations and connotations, paraphrasing, the whole structure of argumentation are all the content of our first-year writing courses. Certainly we don't expect students to come in with none of these skills. I think it would be great if students did come in knowing how to paraphrase. And I think for some of them these tasks are really easy.*

***Note taking and listening skills***: During the many lectures students attend in their freshman years, they are expected to know how to take notes. Faculty observe that students tend to fill up pages without much discernment as to the quality and relevance of the information delivered to them. They need to demonstrate higher levels of attentiveness and engagement with the materials presented during lectures and understand

> *In their own words*
> ***You look at the student's notes. That's a very informative exercise. What's in there is just what's on the overhead— not a single thing beyond it. It doesn't matter what I put on the overhead. I could put a chocolate chip cookie recipe on the overhead. But as soon as it's up there, they write it down. While the basic information is on the overhead, I'm giving a lecture.***

***Analytical skills***: Besides a higher level of engagement in reading and better structure and argumentation in writing, students need to think analytically about the information they collect from their readings, through lectures, of other resources. Faculty expect students to

Be able to categorize information thematically, to see the umbrella questions and the relationships between concepts and theories, and ascertain the main message out of a source/text instead of some details.

Be willing to go deeper and beyond the facts that are presented

Be aware of the difference(s) between summary and description versus interpretation and analysis.

Be able to oscillate between the general and the specifics when one analyzes information and writes.

Be able to compare/contrast and think comparatively.

> *In their own words*
> ***Young students are quite ready to make the generalizations. What they don't deal with are the specifics. They don't know that you're supposed to back up. They can say the world is screwed up, but think they can leave it at that without being more specific.***

***Critical thinking skills***: At almost every institution, faculty commented on the lack of critical reflection in students, that they often do not go beyond such responses as 'I liked it' or 'I didn't like it! when asked to evaluate a piece. They expect students to be able to answer questions that "don't necessarily have right or wrong answers" and that require some reflective and critical thinking. They found students often unable to argue, to differentiate between criticism and critique, and to handle constructive criticism of their work, e.g. they too often take the critique as a personal attack.

***Connective intelligence***: This ability surfaced in many discussions, e.g. how students are unable to bring together personal experiences and knowledge learned in class, or ideas/concepts they read in the literature. In other words, faculty wish students would know how to integrate knowledge from a variety of sources, for example making connections between public knowledge and personal observations and experiences and knowing how to apply and identify ideas and concepts from other disciplines.

*In their own words*

***You need to be willing to receive criticism without perceiving it as an attack to your integrity or your intelligence or creativity. So, we constantly learn to do critiques without tears. And to learn to make an argument that is, you know, is this effective or not? Not, is that a good person or a talented person, or not?***

***Research skills:*** Faculty found that most students lack experience with and understanding of the research process, i.e. how to carry it out, what questions to ask, to whom, which sources to use, and where to find them. They expect students to have the following skills:

*In their own words*

***Too many students don't view sources critically. They'll take a statement from a source at face value.***

Understand plagiarism, what borrowing ideas from other authors mean and how to cite or paraphrase

Be able to research with discernment. For example, students seem to often lack the ability to distinguish the degree of quality and/or reliability of the evidence that they find, e.g. "to qualify the strength of the evidence they find", especially on the Internet.

Understand "sources" and know how to use them so that the sources support one's argument rather than just fill up a piece of paper. Students need to be asking themselves whether what they found is a weak or a strong piece of evidence? Is it a primary or secondary source?

*In their own words*

***Simply for students to ask the question about the credibility of the source, and that applies to print sources too. I think [to] a lot of students a book is a book is a book. Just to be critical about sources in general is something they [must] learn to do.***

Understand the importance of research, even in the "unscientific fields" such as the humanities.

***Knowing how to formulate opinions and expressing and trusting one's original opinion***: Faculty wish students were more assertive with their opinions and asked bolder questions, in order to develop their consciousness and own voices. At various occasions during the review of work samples, faculty noted when a student asserted his/her voice. They appreciated its authenticity and the student's willingness to speak out. The use of the "I" in students' writing was often discussed, e.g. is it used appropriately or too freely by students? Opinions are a good thing but they need to be substantiated/supported by empirical evidence.

*In their own words*

***Students also need to learn that simply having an opinion on a question or topic is <u>not</u> enough. They need to learn to support and justify their argument as rigorously as possible, based on evidence (of whatever nature), and therefore sometimes put the "I" in abeyance.***

***Awareness and understanding of history vis-à-vis literature***: English faculty complain of having to often teach students about historical and contemporary events. They wish students could think diachronically about history, e.g. historical sequencing, and be able to relate a play or a novel to its place in history.

> In their own words
> *They need a better ability to read historical voices. They have so much trouble reading eighteenth century prose, nineteenth century prose, early twentieth century prose. I can't imagine what you'd get with old English. I think that would be very good skills to have because we end up spending a lot of time getting them past that inability to sort of grapple with a primary source from another era. Related to that, talking about context. For example, if you're reading an eighteenth century novel you need to know when the Civil War came, and that was before World War I.*

***Awareness and sense of geography***: Faculty are surprised at the lack of geographical knowledge of most students, for example they are often unable to locate Europe on a map, or to tell where Latin America is, which results in English faculty having to teach basic geographical principles.

> In their own words
> *In geography, and it's not a joke, our students don't know where things are on the map at all. I mean not at all. They think of geography as what's where, period.*

> In their own words
> *A lot of things I wrote down a[re] n't the academic skills, they're the social skills that come with being a freshman. Just the s[ocia]l[i]ty and practice of organizing their own lives now, getting to class. That's an issue. Learning to use time wisely can be very difficult since they don't have a class every hour. Getting assignments done on time, taking responsibility for [one's] own learning, making decisions about how much is enough, being independent, learning those kinds of mechanisms.*

## Attitudes/Social Skills

***Intellectual curiosity/maturity***: Faculty notice that most students not only do not know how to ask questions but do not see the need in doing so. Their engagement with the material is minimal, e.g. simply what the instructor delivers, and no further inquiry. For some faculty it is an issue of intellectual maturity (or lack thereof) that prevents students from being actively engaged in the production of new knowledge. Faculty

express the need for students to "participate in public discourse" well before they enter college, e.g. be able to read a newspaper article and relate world events to US contexts as well as their own local contexts.

> *In their own words*
> *There's also an intellectual independence. At the university level instructors expect students to be able to come up with provocative questions. And I think that's a real challenge for incoming students.*

***Openness***: Faculty find most of their students to be rather closed-minded, e.g. unwilling to look at things, texts, phenomena in ways that differ from what they learned before. Their tolerance for ambiguity is minimal and their resistance to new approaches and ideas rather high.

> *In their own words*
> *I would simply like an openness. I find that they're resistant to anything like theorization or conceptuality, that if it goes against their habitual ways of seeing the world, then they really put up a wall.*

***Showing patience and perseverance.***

Faculty notice low levels of attention and application with more difficult tasks, in the case of English, more difficult readings. They know students can do it, but do they want to do it?

> *In their own words*
> *I never thought I would see a day when people needed Charlotte Brönte and Dickens to be translated for them. I don't think it's a matter of intelligence, it's a matter of patience.*

***Time management and organization skills***: Faculty wish students knew how to better manage their time vis-à-vis their work, e.g. better estimation and acceptance of reading and studying time, that "something may take two hours rather than 15 minutes."

***Understanding of academic expectations***: Faculty wish students would appreciate what college is, e.g. be cognizant

> *In their own words*
> *Students [need to] understand how much work college level assignments are and how much work goes into writing a good paper. We have to talk to them about the fact that it's what you've learned and the skills you've gained. It's a credentialing game.*

of academic expectations and realities of college life, such as hard work, applying oneself, etc. They often feel like they need to baby-sit students more than teach them.

## Appendix B: Key Knowledge and Skills for Mathematics

## I. COMPUTATION

*IA. The student will know basic mathematics operations*

IA.1. Use arithmetic operations with fractions (e.g., add and subtract by finding a common denominator, multiply and divide, reduce)

IA.2. Use exponents and scientific notation (e.g., $(2)(5^x)+(3)(5^x)=5^{x+1}$, $2^3=(2)(2)(2)$ )

IA.3. Use whole numbers to perform all basic arithmetic operations, including long division with and without remainders

IA.4. Use radicals correctly (e.g., $\sqrt{9+16} \neq \sqrt{9}+\sqrt{16}$, explain why negatives don't work inside square roots, –5 is also a square root of 25)

IA.5. Understand relative magnitude, and absolute value

IA.6. Know terminology for real numbers such as irrational numbers, natural numbers, integers, and rational numbers

IA.7. Use the correct order of arithmetic operations

*IB. The student will know and carefully record symbolic manipulations*

IB.1. Use mathematical symbols and language appropriately to express understanding and represent ideas (e.g., equal signs, parentheses, superscripts, subscripts)

*IC. The student will know and demonstrate fluency with mathematical notation and computation*

IC.1. Perform addition, subtraction, multiplication and division

IC.2. Perform appropriate basic operations on sets (e.g., union, intersection, elements of , subsets, complement)

IC.3. Recognize alternative symbols (e.g. Greek letters)

### II. ALGEBRA

*IIA. The student will know and apply basic algebraic concepts*

IIA.1. Use the distributive property to multiply polynomials

IIA.2. Multiply and divide polynomials (e.g., long division)

IIA.3. Factor polynomials (e.g., difference of squares, perfect square trinomials, sum and difference of two cubes)

IIA.4. Add, subtract, multiply, divide, and simplify rational expressions including finding common denominators

IIA.5. Understand properties and basic theorems of roots, and exponents, (e.g., $(x^2)(x^3)=x^5$

IIA.6. Understand properties and basic theorems of logarithms (e.g. product, quotient and power rules; $\log_b v=a$ means $b^a=v$)

*IIB. The student will use various techniques to solve basic equations and inequalities*

IIB.1. Solve linear equations and absolute value equations

IIB.2. Solve linear inequalities and absolute value inequalities

IIB.3. Solve systems of linear equations and inequalities using algebraic and graphical methods (e.g., substitution, elimination, addition, graphing)

IIB.4. Solve quadratic equations using various methods and recognize real solutions

IIB4a. Use factoring and zero products
IIB4b. Use completing the square
IIB5c. Use the quadratic formula

*IIC. The student will be able to recognize and use basic algebraic forms*

IIC.1. Distinguish between expression, formula, equation, and function and recognize when simplifying, solving, substituting in, or evaluating is appropriate (e.g., expand the expression $(x+3)(x+1)$, substitute $a=3, b=4$ into the formula $a^2+b^2=c^2$, solve the equation $0=(x+3)(x+1)$, evaluate the function $f(x)=(x+3)(x+1)$ at $x=-1$)

IIC.2. Determine whether a relation is a function

IIC.3. Understand applications (e.g., determining cost, revenue, and profit situations) of polynomial functions

IIC.4. Use a variety of models (e.g., written statement, algebraic formula, table of input-output values, graph) to represent functions, patterns, and relationships

IIC.5. Understand terminology and notation used to define functions (e.g., domain, range, function composition, inverse)

IIC.6. Understand the general properties and characteristics of many types of functions (e.g., direct and inverse variation, general polynomial, radical, step, exponential, logarithmic, sinusoidal)

*IID. The student will understand the relationship between equations and graphs*

IID.1. Understand slope-intercept form of the equation of a line and graph the line

IID.2. Graph a quadratic function and recognize the intercepts as solutions to a corresponding quadratic equation

IID.3. Know the basic shape of the graph of an exponential function

*IIE. The student will know how to use algebra both procedurally and conceptually*

IIE.1. Recognize which type of model (i.e., linear, quadratic, exponential) best fits the context of a situation

*IIF. The student will demonstrate ability to algebraically work with formulas and symbols*

IIF.1. Understand formal notation (e.g., sigma notation, factorial representation) and various applications (e.g., compound interest) of sequences and series

## III. TRIGONOMETRY

*IIIA. The student will know and understand basic trigonometric principles*

IIIA.1. Know the definitions of the trigonometric ratios sine, cosine, and tangent using right triangle trigonometry and position on the unit circle

IIIA.2. Understand the relationship between a trigonometric function in standard form and its corresponding graph (e.g., domain, range, amplitude, period, phase shift, vertical shift)

IIIA.3. Know and use identities for sum and difference of angles (e.g., sin $(x \pm y)$, cos $(x \pm y)$, tan $(x \pm y)$)

IIIA.4. Recognize periodic graphs

IIIA.5. Understand concepts of periodic and exponential functions and their relationships to trigonometric formulas, exponents, and logarithms

IIIA.6. Solve problems using exponential models (e.g., How long does it take for an investment to triple if it doubles in ten years?, radioactive decay, population problems)

IIIA.7. Understand and use double and half angle formulas

## IV. GEOMETRY

*IVA. The student will know synthetic (i.e., pictorial) geometry*

IVA.1. Use properties of parallel and perpendicular lines in working with angles

IVA.2. Know triangle properties

IVA.3. Understand the concept of mathematical proofs, their structure and use

IVA.4 Use geometric constructions (e.g., the parallel to a line through a given point not on the line, line segment congruent to a given line segment ) to complete simple proofs, to model, and to solve mathematical and real-world problems

IVA5. Use similar triangles to find unknown angle measurements and lengths of sides

*IVB. The student will know analytic (i.e., coordinate) geometry*

IVB.1. Know geometric properties of lines (e.g., slope, midpoint, distance)

IVB.2. Know the equations for conic sections

IVB.3. Use the Pythagorean Theorem and its converse and properties of special right triangles (e.g., 30°-60°-90° triangle) to solve mathematical and real-world problems (e.g., ladders, shadows, poles)

IVB.4. Use transformations of figures to graph simple variations of equations for basic graphs (e.g., lines, circles, absolute values)

IVB.5. Set up appropriate coordinate systems for applications

IVB.6. Understand vectors in mathematical settings

*IVC. The student will understand the relationships between geometry and algebra*

IVC.1. Know how to manipulate conics

IVC.2. Understand that objects and relations in geometry correspond directly to objects and relations in algebra (e.g., a line in geometry corresponds to a set of ordered pairs satisfying an equation $ax + by = c$)

IVC.3. Solve real-world problems involving three-dimensional objects (e.g., volume, surface area)

*IVD. The student will understand the relationships between geometry and trigonometry*

IVD.1. Use trigonometry to solve mathematical and real-world problems (e.g., determination of the angle of depression between two markers on a contour map with different elevations)

*IVE. The student will demonstrate geometric reasoning*

IVE.1. Prove congruency of triangles

IVE.2. Use inductive and deductive reasoning to make observations about and to verify properties of and relationships among figures (e.g., the relationships among interior angles of parallel lines cut by a transversal)

*IVF. The student will be able to combine algebra, geometry, and trigonometry*

IVF.1. Understand and use the law of sines and the law of cosines

IVF.2. Use properties of and relationships among figures to solve mathematical and real-world problems (e.g., use the property that the sum of the angles in a quadrilateral is equal to 360 degrees to square up the frame for a building; use understanding of arc, chord, tangents, and properties of circles to determine the radius given a circular edge of a circle without the center)

## V. MATHEMATICAL REASONING

*VA. The student will demonstrate an ability to solve problems*

VA.1. Use inductive reasoning

VA.2. Demonstrate ability to visualize (e.g., know what a function looks like as a graph)

VA.3. Use multiple representations (e.g., analytic, numerical, geometric) to solve problems

VA.4. Use a framework or mathematical logic to solve problems that combine several steps

VA.5. Use a variety of strategies (e.g., identify a pattern) to understand new mathematical content and to develop more efficient solution methods or problem extensions

VA.6. Construct logical verifications or counter examples to test conjectures and to justify algorithms and solutions to problems (i.e., use deductive reasoning)

*VB. The student will understand various representations of mathematics (e.g., verbal, pictorial, abstract)*

VB1. Understand abstract mathematical ideas in word problems, pictorial representations, and applications

*VC. The student will demonstrate a thorough understanding of mathematics used in applications*

VC.1. Understand the concept of a function (i.e., a function describes how changes in one quantity or variable result in changes in another)

*VD. The student will demonstrate strong memorization skills*

VD.1. Know a variety of formulas and short proofs

*VE. The student will know how to estimate*

VE.1. Understand the relationships among equivalent number representations (e.g., 1.33 compared to 4/3)

VE.2. Know when an estimate or approximation is more appropriate than an exact solution for a variety of problem situations

VE.3. Recognize the validity of an estimated number

*VF. The student will understand the appropriate use of technology*

VF.1. Know the appropriate uses of calculators and their limitations

VF.2. Perform difficult computations using a calculator (e.g., negative exponents, scientific notation)

VF.3. Know how to use graphing calculators (e.g., approximating solutions to equations such as $\ln x = -x$, or other transcendental equations

*VG. The student will be able to generalize (e.g., to go from general to abstract and back and to go from specifics to abstract and back)*

VG.1. Determine the mathematical concept from the context of a real-world problem, solve the problem, and interpret the solution in the context of the real-world problem

*VH. The student will be willing to experiment with mathematics*

VH.1. Understand that math problems can have multiple solutions and multiple methods to determine the solution(s)

*VI. Student will emphasize process over mere outcome(s)*

VI.1. Understand the various steps to a solution

*VJ. The student will show ability to modify patterns and computations for different situations*

VJ.1 Compare a variety of patterns and sequences (e.g., 0,1,4,9,16,25; 1,2,5,10,17,26)

*VK. The student will use trial and error to solve problems*

VK.1 Find the way(s) that did not work to solve a problem and finally find the one(s) that do work

*VL. The student will understand the role of mathematics*

VL.1. Know the relationships between the various disciplines of math (e.g., arithmetic, algebra, geometry, trigonometry, calculus, probability, statistics)

VL.2. Understand the connections between mathematics and other disciplines (e.g., science, economics, architecture)

*VM. The student will use mathematic models*

VM.1. Use mathematical models from other disciplines (e.g., DNA, Knot Theory, Carbon Dating)

*VN. The student will understand that s/he needs to be an active participant in the process of learning mathematics*

VN.1. Ask questions throughout multi-step projects, recognizing natural questions arising from a mathematical solution (e.g., If a problem has no solution, why not?, Is there a next best alternative?, Is this always true?)

VN.2. Use appropriate math terminology

VN.3. Understand that mathematical problem solving takes time (e.g., some problems took centuries to be solved, some remain unsolved, some have been proven to be unsolvable)

*VO. The student will understand that mathematics is a symbolic language and that fluency requires practice*

VO.1. Translate simple statements into equations (e.g., "John is twice as young as Bill" can be expressed by the equation b=2j)

VO.2. Understand the role of written symbols in representing mathematical ideas and the precise use of special symbols of mathematics

## VI. STATISTICS

*VI. The student will understand and apply concepts of statistics and data analysis*

VIA.1 Select and use the best method of representing and describing a set of data (e.g., scatter plot, line graph, two-way table)

VIA.2 Understand measures of central tendency and variability (e.g., standard deviation, range, quartile deviation) and their applications to specific situations

VIA.3. Understand different methods of curve-fitting (e.g., median-fit line, regression line) and various applications (e.g., making predictions)

### *Mathematics Narrative*

**To know basic mathematical concepts:** Almost unanimously, faculty agreed that entering students need to demonstrate knowledge of basic mathematical concepts, be it in computation (for example, how to add, subtract, multiply), algebra (for example, understand properties and basic theorems) trigonometry (for example, know how to solve problems using exponential models), or geometry (for example, know triangle properties).

**In their own words**
Students need to know basic arithmetic and algebra, negative numbers, fractions, equation solving. They need to know that they can add things to both sides. They get negative numbers backwards, and can't do basic adding and subtracting to solve equations.

### *General cognitive skills/attitudes*

**Understand mathematics as an inquiry process**:

Faculty want students to understand that mathematics is a way of understanding, a process in which they need to be engaged analytically. They expect students to approach a math problem as they would a research project, e.g. an inquiry where the process is as

important as the outcome. They identified a set of skills that illustrate this approach to mathematics:

Use experimental thinking when approaching a math problem, e.g. be curious and willing to investigate the steps used to reach a solution, understand that there can be multiple approaches to solving a problem, and that math problem can have multiple solutions.

In their own words
Many more students like literature, history, etc. Mathematics inherently has problems. It is not viewed as an intellectual pursuit, but presented as a tool. Students need to understand that process is also important. They tend to put too much emphasis on the answer.

Students need to think conceptually about math, to see that there exists relationships between mathematical concepts and that formulas do not function in a vacuum.

Students are expected to understand the step-by-step approach to solving math problem and to explore the reasons why step two follows step one, etc. so that they can visualize the final product. For that reason, students need to engage in more reflection about the problem they solve, questioning the steps they use as well as their results.

In their own words
Students have to be sure of the pieces and sure of how you they put them together. To understand, "now that I've done this step, what do I know? What am I sure of?.

Students need to demonstrate logical reasoning and common sense as they work out a math problem and find a solution, e.g. check the viability of their

In their own words
Students need to be curious about what are we going to do with [the solution]? Or is the answer plausible? Does it make sense? They come up with answers that are glaringly wrong. One of my students calculated the height of the Sears Towers at 30 miles. He had done the algebra problem, but was not thinking of the content of the problem to see if this could be wrong.



BEST COPY AVAILABLE

solutions through, for example, visualization.

Faculty want students to realize that math problems may not have instant/quick solutions and that they often require long periods of time before a solution can be found.

**Ability to write in concise and clear manner**: In mathematics, students are expected to pay as much attention to the clarity and cohesiveness of their writing as they would in English. This is an important tool they need to communicate their understanding of the mathematical concepts they are learning and discuss the solutions they find.

**Being able to solve problems**:

**Using technology appropriately**: Faculty noticed how dependent students had become on calculators and that they tend to use them inadequately, e.g. to solve everything math problem. They do not deny the importance and relevance of technology but want students to be aware of its limitations and that technological tools, such as graphing calculators, only contribute to solve certain problems.